[Document Name]   Application for Patent

[Reference No.]   061642

[Application Date]   October 16, 2002

[Destination]   Commissioner, Patent Office

[International Patent Classification]   B65H 31/26

[Title of the Invention] PAPER LEAF ACCUMULATING AND DELIVERING METHOD, APPARATUS THEREFOR, AND ROTARY MEANS

[Number of Claim(s)]   4

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[Designation of Charge]

[Ledger No. for Payment]	006356
[Amount of Payment]	¥21,000

[List of Document Submitted]

[Object Name]	Specification	1
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[Object Name]	Abstract	1

[Number of Comprehensive Power of Attorney] 9705601

[Number of Comprehensive Power of Attorney] 0201561

[Necessity of Confirmation] Necessary

[Name of Document] Specification

[Title of the Invention] PAPER LEAF ACCUMULATING AND DELIVERING METHOD, APPARATUS THEREFOR, AND ROTARY MEANS

[Scope of Claim for Patent]

[Claim 1]

A paper leaf accumulating and delivering method of carrying out an accumulating process for dropping paper leaves conveyed through a delivery section and causing the paper leaves to be accumulated in an accumulation section, and a delivering process for delivering said paper leaves accumulated in said accumulation section to said delivery section, said paper leaf accumulating and delivering method comprising

a step of causing rotary means arranged near a connecting section between said delivery section and said accumulation section to be actuated, said rotary means being provided with deformable pieces that are deformable in radius distances between their tip portions and a rotating shaft,

wherein

at the time of the accumulating process, said rotary means is rotated in an accumulation direction and kicks off said paper leaves through said deformable pieces in which said radius distances are increased, and

at the time of the delivering process, said rotary means is rotated in a delivery direction and allows said paper leaves to be delivered.

[Claim 2]

A paper leaf accumulating and delivering apparatus for carrying out an accumulating process for dropping paper leaves conveyed through a delivery section and causing the paper leaves to be accumulated in an accumulation section, and a delivering process for delivering said paper leaves accumulated in said accumulation section to said delivery section, said paper leaf accumulating and delivering apparatus being provided with rotary means arranged near a connecting section between said delivery section and said accumulation section, said rotary means being provided with deformable pieces that are deformable in radius distances between their tip portions and a rotating shaft,

said rotary means being designed such that

at the time of the accumulating process, said rotary means is rotated in an accumulation direction and actuated so as to kick off said paper leaves through said deformable pieces in which said radius distances are increased, and

at the time of the delivering process, said rotary means is rotated in a delivery direction and carries out a delivery-allowing operation for allowing said paper leaves to be delivered.

[Claim 3]

The paper leaf accumulating and delivering apparatus as set forth in claim 2, wherein said deformable pieces are formed into curved shapes in such a manner that their middle portions between said tip portions and their base portions adjacent said rotating shaft are curved toward a rotating direction/retracted side at the time of the kicking operation.

[Claim 4]

Rotary means used in said paper leaf accumulating and delivering method as set forth in claim 1 or said paper leaf accumulating and delivering apparatus as set forth in claim 2 or 3, said rotary means including deformable pieces that are deformable in radius distances between their tip portions and a rotating shaft.

[Detailed Description of the Invention]

[0001]

[Field of the Invention]

This invention relates to a paper leaf accumulating and delivering method and apparatus for carrying out accumulating and delivering of paper leaves, for example, in a manner that causes bills to be piled up in an accumulation section from a conveyance way in an accumulating process of bills such as a received-money handling process or the like, and that delivers the bills to the conveyance way from the accumulation section in a delivering process of the bills such as a handling process for money to be drawn out, or the like, and also relates to rotary member.

[0002]

[Description of the Prior Art]

Hitherto, as a bill accumulating and delivering apparatus for carrying out accumulating and delivering of bills that are required in, for example, an ATM, there is proposed a bill accumulating and delivering apparatus 1' that has an impeller 91 of rubber material provided at a portion of the apparatus that is adjacent an accumulation port of the apparatus for allowing bills to be conveyed and discharged to an accumulation section therethrough, the impeller being adapted to be actuated at the time of a bill-accumulating process and retracted at the time of a bill-delivering process (see patent reference 1, for example).

[0003]

The structure and operation of this bill accumulating and delivering apparatus 1' will be briefly explained with reference to Figs. 10 and 11 which show right side sectional views of the apparatus.

[0004]

At the time when the bill accumulating and delivering apparatus carries out an accumulating process for accumulating bills 2, a feed roller 31 is rotated in an accumulation direction as shown in Fig. 10 (in a counterclockwise direction in the Figure), by the rotation force of which the bills 2 are conveyed through a conveyance way 51. At this time, the impeller 91 is being rotated in the accumulation direction (in a clockwise direction in the Figure) and a centrifugal force produced by the rotation causes impeller vanes 91a to be brought to deployed conditions. For this reason, when the bills 2 conveyed along the conveyance way 51 are discharged to an accumulation space 3, the bills 2 are swatted off by the impeller vanes 91a and smoothly piled up on a vertically fluctuating plate 11 in a flat fashion.

[0005]

At the time when the bill accumulating and delivering apparatus 1' carries out a delivering process for delivering bills 2, a pick-up rotary member 61 is controlled so as to be brought to a downwardly pivoted condition as shown in Fig. 11, and rotated in a delivery direction (in a counterclockwise direction in the Figure), whereby the bills 2 are delivered to the conveyance way 51. At this time, the impeller 91 is not rotated and stopped and the impeller vanes 91 are brought to closed conditions (equally retracted conditions). For this reason, when the feed roller 31 is rotated in the delivery direction (in a clockwise direction in the Figure), by the rotation of which the bills are conveyed through the conveyance way 51, the delivering and conveying of the bills are not interrupted by the impeller vanes 91a.

[0006]

Therefore, in the bill accumulating and delivering apparatus 1', a mechanism for controlling an impeller itself so as to move the impeller vertically that is required for a conventional type of impeller of plastic film is omitted and the cost of the apparatus is, therefore, lowered.

[0007]

[Patent Reference 1]

Specification of Japanese Patent Application No. 2001-368334

[0008]

[Problem to be Solved by the Invention]

However, in the bill accumulating and delivering apparatus 1' such as an ATM or the like that frequently carries out the accumulating operation and the delivering operation, the impeller 91 is overdriven. When the use of the impeller 91 is continued, its rubber material is plastically deformed. When the number of operation days is increased, the impeller vanes 91a become deployed even if the impeller is in a stopped condition. For this reason, the bills that are delivered from the conveyance way 51 strike against the impeller vanes 91a, thus contributing to a jam of paper leaf.

[0009]

Moreover, at the time of the accumulation, the impeller vanes 91a are bent prevailingly at middle portions between their tip portions and base portions adjacent a rotating shaft, so that contact angles between the impeller vanes 91a and the bills 2 produced at the time when the bills are swatted off by the impeller vanes 91a increase and, therefore, the impeller can not adequately cope with deformed bills 2 such as folded bills or the like (hereinafter referred to as "deformed bills").

[0010]

In view of the foregoing problems, an object of the present invention is to provide a paper leaf accumulating and delivering method and apparatus which can adequately cope with deformed bills at the time of accumulating of bills and in which delivering of bills is not prevented at the time of delivering regardless of the plastic deformation, and to provide rotary means, whereby the frequencies of replacement of the rotary means and maintenance of the rotary means can be reduced, continuously running time of the paper leaf accumulating and delivering apparatus can be extended, and the synthetic decreasing of costs including the production cost and running cost of the paper leaf accumulating and delivering apparatus are realized.

[0011]

[Means for Solving the Problem]

A paper leaf accumulating and delivering method and apparatus, according to the present invention, for carrying out an accumulating process for dropping paper leaves conveyed through a delivery section and causing the paper leaves to be accumulated in an accumulation section, and a delivering process for delivering the paper leaves accumulated in the accumulation section to the delivery section, is characterized in that the paper leaf accumulating and delivering method and apparatus causes rotary means arranged near a connecting section between the delivery section and the accumulation section to be actuated, the rotary means being provided with deformable pieces that are deformable in radius distances between their tip portions and a rotating shaft, the rotary means being designed such that at the time of the accumulating process, the rotary means is rotated in an accumulation direction and actuated so as to kick off the paper leaves through the deformable pieces in which the radius distances are increased, and at the time of the delivering process, the rotary means is rotated in a delivery direction and carries out a delivery-allowing operation for allowing the paper leaves to be delivered.

[0012]

The above-described paper leaves include bills, cards, paper and printed paper.

The above-described deformable pieces includes members, that are formed of resinous material such as deformable rubber material or deformable metal material such as elastic sheets of iron, deformable structures in which the base portions adjacent the rotating shaft and/or the middle portions between the base portions and tip portions are pivotally moved so as to be foldable or bendable in rotational directions, or members that are formed of flexible material which allows the deformable pieces to be elastically deformed in a radius direction of the rotating shaft.

[0013]

Moreover, the deformable pieces include belt-like members having predetermined widths, thicknesses and lengths, or cord-like members having predetermined diameters. Furthermore, where the deformable pieces are belt-like members, they may be of fixed forms having fixed widths, thicknesses and lengths, be of tapered forms having tapers increased in their thicknesses toward tip portions, be of tapered forms having tapers increased in widths toward tip portions, and be of tip-weighted forms provided at their tip portions with weights. Moreover, where the deformable pieces are cord-like members, they may be of fixed forms having fixed diameters, of tapered forms having tapers increased in diameters toward tip portions, and of tip-weighted forms provided at their tip portions with weights.

[0014]

The above-mentioned tip portions are given to mean tip portions of outer sides of the deformable pieces.

[0015]

The above-mentioned rotary means includes a roller provided with one or more deformable pieces (or a roller with one or more vanes) or a rotating shaft with one or more deformable pieces (or a rotating shaft with one or more vanes).

[0016]

The above-mentioned rotating shaft includes a rotating shaft to which the above-mentioned rotary means is attached by mounting the rotary means on the rotating shaft or by adhesive bonding, or a rotating shaft that is formed as a part of the rotary means.

[0017]

The above-mentioned knocking-off operation includes knocking-off of the paper leaves through the tip portions and/or middle portions of the deformable pieces.

[0018]

The above-mentioned delivery-allowing operation includes rotating of the rotary means in the delivery distance at a speed equal to a delivery speed and causing the deformable pieces not to contact the paper leaves so as not to prevent the delivery of the paper leaves or causing the deformable pieces to contact the paper leaves so as to facilitate the delivery of the paper leaves.

[0019]

Incidentally, the above-mentioned rotation in the accumulation direction and the above-mentioned rotation in the delivery direction are given to mean the clockwise rotation (accumulation direction) at the time of accumulation and the counterclockwise rotation (delivery direction) at the time of delivery, respectively, if, for example, viewed from the right side, the accumulation section is situated on the right-hand side, the conveyance way is situated upward on the left-hand side, and the rotary means is situated downward on the left-hand side of the connecting section between the conveyance section and the accumulation section.

[0020]

In a preferable working example, the deformable pieces are formed into curved shapes in such a manner that the middle portions between the tip portions and the base portions adjacent the rotating shaft are allowed to be curved toward a rotating direction/retracted side (a retracted direction relative to the rotational direction).

[0021]

The above-mentioned curved shapes include complete circular arc-shapes, distorted circular arc-shapes different in a degree of bending in predetermined regions including the tip portions, the middle portions or the base portions, and bent shapes considered as the entire bent shapes in which one or more regions are bent.

[0022]

Moreover, the present invention is also applied to a rotary means that is provided with deformable pieces deformable in radius distances between the tip portions and the rotating shaft and can be employed as rotary means to be used in the paper leaf accumulating and delivering method and apparatus.

[0023]

[Effect of the Invention]

In accordance with the present invention, there is provided a high-performance, paper leaf accumulating and delivering apparatus that prevents jamming of the paper leaves in the accumulating and delivering operations and smoothly carries out the accumulating and delivering operations. Moreover, it is possible to allow the usable time of the rotary means to be extended and reduce the maintenance cost, thus achieving the synthetic decreasing of costs.

[Mode for carrying out the Invention]

[0024]

A working example of the present invention will be explained with reference to the drawings.

First of all, the appearance and construction of a bill accumulating and delivering apparatus 1 will be explained with reference to Fig. 1 illustrating a perspective view of the bill accumulating and delivering apparatus 1.

[0025]

The bill accumulating and delivering apparatus 1 is formed into a box-shape in outline, the interior of which has an accumulation space 3 for allowing bills 2 to be flatly piled up and a vertically fluctuating plate 11 provided at a bottom portion of the accumulation space 3 and having a bill size (a size substantially corresponding to that of the bill).

[0026]

The vertically fluctuating plate 11 is adapted to be guided so as to be vertically movable along sidewalls in a horizontal condition. The vertically fluctuating plate 11 is secured at a fixing portion 12 thereof to a portion of a vertically traveling belt 13. The vertically traveling belt 13 is traveled in normal and reverse directions with normal and reverse revolution control of a reversible motor (pulse motor) 14 by any suitable control means, whereby the vertically fluctuating plate is controlled so as to be vertically moved.

[0027]

At an upper portion of the bill accumulating and delivering apparatus 1, a feed shaft 32 is laterally built and borne. Two feed rollers 31, 31 of substantially pillar-shapes are mounted on the feed shaft 32 and spaced apart from each other at a predetermined interval. By the feed rollers 31, 32, the bills 2 are conveyed toward an inner part of the apparatus at the time of accumulation and conveyed upward at the time of delivery.

[0028]

On one end of the feed shaft 32 (a right-hand end in the Figure), a gear wheel 34 is mounted. Through the gear wheel 43 and a gear wheel 42 secured to the reversible motor 41, the rotation force of the reversible motor 41 is obtained as a driving force. Incidentally, the reversible motor 41 is adapted to be controlled by the suitable control means so as to rotated in the normal and reverse directions.

[0029]

On the other end of the feed shaft 32 (a left-hand end in the Figure), a gear wheel 33 is mounted. The gear wheel 33 is adapted to transmit the driving force through a gear wheel 24 to a shaft 22 that is built and borne at a position lower than the feed shaft 22 and short of the feed shaft 22.

[0030]

The shaft 22 is provided with two gate rollers 25, 25 which are opposed to the feed rollers 31, 31 and around peripheral surface of which protruding portions that can slightly get in grooves formed in the feed rollers 31, 31 are provided. The feed rollers 31 and the gate rollers 25 overlap each other. Incidentally, the gate rollers 25 are constructed such that they are rotated in an accumulation direction at the time of the accumulation and stopped without being rotated at the time of delivery.

[0031]

On the outsides of the gate rollers 25, there are provided centrifugal-force impellers 21, 21 for swatting off the bills at the time of the accumulation. Incidentally, the shaft 22 thus serves as an impeller shaft for the centrifugal-force impellers 21.

[0032]

As will be discussed hereinafter, the centrifugal-force impellers 21 are made of any suitable rubber material so that impeller vanes 21a are in stored conditions when the centrifugal-force impellers are in non-rotated or stopped conditions, and the impeller vanes 21a are deployed due to centrifugal forces produced by rotation (rotating operation) as will be discussed hereinafter.

[0033]

Moreover, the centrifugal-force impellers 21 are constructed so that they are rotated in the accumulation direction at the time of the accumulation, and rotated in the delivery direction at the time of the delivery. The detailed description of such a construction will be made hereinafter.

Incidentally, the centrifugal-force impellers 21, the shaft 22, and the gate rollers 25 constitute an accumulating and delivering auxiliary-unit 20 (mentioned below).

[0034]

One end of the shaft 22 (a right-hand end in the Figure) is borne to a positioning plate 44 on the outside of the accumulation space 3. The end (a right-hand end in the Figure) of the feed shaft 32 also borne to the positioning plate 44 is positioned.

[0035]

The above-mentioned construction allows the bills 2 to be conveyed by conveyance forces of the feed rollers 31 and the gate rollers 25, allows the bills 2 to be piled up in the accumulation space 3 at the time of the accumulation, and also allows the bills 2 to be delivered from a conveyance way at the time of the delivery. At the time of the accumulation and delivery, the centrifugal-force impellers 21 also serve to assist in the operation.

[0036]

Referring now to Fig. 2 showing an exploded perspective view of the accumulating and delivering auxiliary-unit 20, the structure of the accumulating and delivering auxiliary-unit 20 will be explained hereinafter.

[0037]

In the accumulating and delivering auxiliary-unit 20, a center coupling section 23, the gate rollers 25, 25 at both sides of the center coupling section 23 and a gear 26 at the outside of the left-hand gate roller 25 are mounted on the shaft 22 of metal material such that they are rotated together. E-shape rings 27 that are washer-shaped fasteners are mounted in stop grooves 22a of the shaft 22 in such a manner to interpose both sides of a gate section 20a comprised of the coupling section 23, the gate rollers 25 and the gear 26, whereby the gate section 20a are positioned.

[0038]

The centrifugal-force impellers 21 are disposed on the outsides of the gate section 20a and fixedly mounted on the shaft 22.

[0039]

The accumulating and delivering auxiliary-unit 20 constructed as described above has such a structure as to be illustrated in Fig. 3 showing a front view and Fig. 4 showing a sectional view, and the gate section 20a is rotated together.

[0040]

That is, as shown in Fig. 4, the gate rollers 25 are formed at sides thereof with engaging holes (recess portions) with which engaging protrusions 23a, 26a respectively provided on a side surface of the coupling section 23 and a side surface of the gear 26 are engaged, whereby they are coupled to one another. Therefore, the components that are coupled to one another can not be independently rotated, and are rotated and non-rotated together as the gate section 20a.

[0041]

The coupling section 23 has a one-way clutch 23b provided in the interior thereof, which is unrotatable relative to the shaft 22 in the accumulation direction, namely, rotated together with the shaft 22, and free relative to the shaft 22 in the delivery direction.

[0042]

The gear 26 is coupled at a lower location thereof to a one-way gear 28. The one-way gear 28 is formed in a peripheral surface thereof with a gear 28a which is meshed with the gear 26, whereby rotation is transmitted to the gear 28. The one-way gear 28 has a one-way clutch 28b housed within an interior thereof. The one-way gear 28 is supported to a fixing shaft 29a of a fixing section 29 such that a direction of the clutch is set in such a manner that rotation in the delivery direction is stopped and a rotation in the accumulation direction is allowed, by the one-way clutch 28b. Incidentally, the fixing section 29 is secured to a guide plate 52 (described below) of the conveyance way.

[0043]

Due to this construction, the one-way gear 28 allows the gate rollers 25, 25 to be rotated in the accumulation direction, and stops them in the delivery direction as a non-rotation.

[0044]

Consequently, in the accumulating and delivering auxiliary-unit 20, all the components are rotated by the shaft 22 at the time of the accumulation and, at the time of the delivery, the centrifugal-force impellers 21 and the shaft 22 are rotated but the gate section 20a is in the non-rotating state (or the stopped state).

[0045]

Due to the above-mentioned construction, at the time of the accumulating operation, the gate section 20a and the centrifugal-force impellers 21 are rotated, to thereby supplements the accumulating operation. At the time of the delivery, the gate section 20a is stopped and applies friction force in such a manner that the second from the uppermost bill and later bills among the bills 2 stacked in the accumulation space 3 are not delivered. At the time of the delivery, the centrifugal-force impellers 21 are rotated in the delivery direction and supplement the delivering operation.

[0046]

Now, the shape and function of the centrifugal-force impeller 21 will be explained with reference to Fig. 5 showing an explanatory view of the centrifugal-force impeller 21.

In the Figure, (A) shows a perspective view of the centrifugal-force impeller 21 in a stopped state and (B) shows a perspective view of the centrifugal-force impeller 21 in a rotated state.

[0047]

As shown in the (A), the centrifugal-force impeller 21 is formed of rubber material as a one-piece member that is comprised of a cylindrical portion 21b and vanes 21a provided at four portions of the side of the cylindrical member 21b which are equally spaced.

[0048]

The vane 21a has a shape in which a circular arc-shaped base portion 21c having a small radius is connected to one end of a circular arc-shaped middle portion 21d, and is formed into an inverted taper-shape in which a thickness gradually increases from the base portion 21c adjacent the cylindrical portion 21b to a tip portion 21e.

[0049]

When the centrifugal-force impeller 21 constructed as described above is rotated in a normal direction (the accumulation direction), the vanes 21a are deployed due to centrifugal forces as shown in (B), and radius distances between the tip portions and a rotating shaft are increased. At the time of the rotation, the vanes 21a are easy to be deployed since the vanes 21a are formed into the inverted taper-shape as described above and the tip portions 21e are therefore heavy.

[0050]

Moreover, when the centrifugal-force impeller 21 is rotated in the reverse direction (the delivery direction), the vanes 21a are easy to be deployed in the same manner as in the case where the centrifugal-force impeller is rotated in the normal direction.

[0051]

Owing to the above-mentioned shape, where the centrifugal impeller 21 is rotated in the accumulation direction as indicated by an arrow direction of a hypothetical line, the bills 2 shall be knocked off by inner surfaces of the middle portions 21d or the tip portions 21e. Knocking forces applied at this time are strong forces since biasing forces that tend to cause the rubber material to be returned to its original shape are also applied in a knocking direction.

[0052]

On the other hand, when the centrifugal-force impeller is rotated in the delivery direction that is the reverse direction, the bills 2 shall be knocked off (or wiped or extruded) by outer surfaces of the middle portions 21d or the tip portions 21e. The knocking forces applied at this time are weak forces since the biasing forces that tend to cause the rubber material to be returned to its original shape are applied in a reverse direction.

[0053]

Now, the accumulating operation and delivering operation of the bill accumulating and delivering apparatus will be explained with reference to Fig. 6 illustrating a right side sectional view of the bill accumulating and delivering apparatus at the time of the accumulation and Fig. 7 showing a right side sectional view of the bill accumulating and delivering apparatus at the time of the delivery.

[0054]

As shown in Figs. 6 and 7, the bill accumulating and delivering apparatus is provided at an upper location of the front side with the feed rollers 31 described above with reference to Fig. 1, and provided in back of the feed rollers 31 with pick-up rotary means 61 which is comprised of pulleys 63, 64 and a belt 62 installed between the pulleys 63, 64.

[0055]

The pick-up rotary means is constructed so as be driven by any suitable drive means in such a manner to be vertically moved about the inner pulley 64 at the time of the accumulation and delivery and in such a manner to come into contact with the accumulated bills at the time of the delivery and convey them in the delivery direction.

[0056]

The conveyance way 51 for allowing the bills to be conveyed therethrough is comprised of a guide plate 53 that is arranged a location slightly spaced inward from the peripheries of the feed rollers 31, guides the upper sides, these sides and lower sides of the feed rollers 31, and horizontally extends as it is, and a guide plate 52 that extends just below from a bill delivering port 54 disposed at this side of an upper end of the bill accumulating and delivering apparatus 1, partially curved along the peripheries of the feed rollers 31 and again extends immediately beneath the feed rollers 31.

[0057]

Incidentally, the fixing member 29 (not shown) explained with reference to Fig. 4 is secured to the guide plate 52 by a screw

Moreover, in the proximity of a connecting portion 3a between the conveyance way 51 and the accumulation space 3, the above-mentioned accumulating and delivering auxiliary-unit 20 (namely, the gate section 20a and the centrifugal-force impellers 21) is arranged.

[0058]

At a location slightly spaced rearward from the above-mentioned bill delivering port 54, a bill loading port 55 is provided. The bill loading port 55 and the bill delivering port 54 are integrated with each other within the interior and communicated with the above-mentioned conveyance way 51.

[0059]

With the above constituent and construction, the bill accumulating and delivering apparatus will be operated at the time of the accumulation and delivery, in such a manner as to be described hereinafter.

At the time of the accumulation, bills 2 carried in from the bill loading port 55 are conveyed in the conveyance way 51 by feeding forces of the feed rollers 31, discharged into the accumulation space 3, and accumulated on the vertically fluctuating plate 11.

[0060]

At the time of this accumulation, the vanes 21a of the centrifugal-force impellers 21 having been rotated synchronously with the feed rollers 31 as shown in Fig. 6, knock off the bills 2 and prevent bills conveyed by turns from being struck against one another in the accumulation space 3 and jammed.

[0061]

At this time, the gate rollers 25 are rotated together with the shaft 22 and the centrifugal-force impellers 21 due to the action of the one-way clutch 23b described above, and the one-way gear 28 is brought to the free condition and allows the above-mentioned rotation to occur.

[0062]

Incidentally, at this time, the pick-up means 61 is in a raised condition so as not to prevent the accumulation of the bills 2.

[0063]

At the time of the delivery, the pick-up means 61 is brought to a lowered condition as shown in Fig. 7, picks up the flatly piled up bills 2 and sends them to the conveyance way 51.

At this time, the feed rollers 31 and the centrifugal-force impellers 21 are synchronously rotated in the reverse direction to the direction at the time of the accumulation, and the gate rollers 25 become free from the shaft 22 due to the action of the above-mentioned one-way clutch 23b and is stopped due to the action of the one-way clutch 28.

[0064]

Thus, the centrifugal-force impellers 21 forward the bills 2 delivered to the conveyance way 51, in such a manner to wipe them, to thereby supplement the delivering of the bills 2. Moreover, the gate rollers 25 are stopped and prevent the second and later bills 2 from being taken out, with friction forces.

[0065]

In this way, by the centrifugal impellers 21 that are simple in construction, the accumulating and delivering of the bills can be smoothly carried out and the jamming of the bills can be prevented, thus improving performance.

[0066]

Furthermore, the centrifugal-force impellers 21 are arranged outside the feed rollers 31 and the gate rollers 25 as shown in Fig. 8 showing the front view, and urge the bills 2 upward both at the time of the accumulation and at the time of the delivery, so that the centrifugal-force impellers 21 serve to cause the bills to be extended so as not to be folded, by pulling the bills outward (both lateral sides). Thus, it is possible to effectively prevent old bills from being loosened between the feed rollers 31, 31 and from being jammed.

[0067]

Moreover, as shown in an explanatory view of Fig. 9, effects in which the accumulating and delivering of deformed bills can be smoothly carried out can be also obtained. That is, when a bill folded as shown in (C) is accumulated, the vanes 21a can positively knock off the bill with a small angle because the middle portions 21d of the vanes 21a are curved in retracted directions further than the tip portions 21e, as compared to the case where the vanes are formed straightly or curved in the reverse directions.

[0068]

The knocking-off forces generated at this time include the centrifugal force and elastic forces of the vanes 21a, so that strong forces that can sufficiently cope with the deformed bill can be obtained.

In this way, when the bill 2 that is finally bent upward as shown is accumulated, it is possible to prevent a next bill 2 from being struck against a bent portion of the folded bill and from being jammed.

[0069]

At the time of the delivery, it is also possible to smoothly deliver the deformed bill (bill 2) in which a forward side of the deformed bill is deformed as shown in (D). That is, if the forward side of the deformed bill is deformed as shown, conventionally the deformed bill is interposed between the feed rollers 31 and the gate rollers 25, and brought to a perfectly bent condition, so that the deformed bill has a thickness corresponding to that of two bills and the overlapped portion of the bill can not pass and is jammed. However, the vanes 21a send the bill 2 in the delivery direction in such a manner to wipe the bill from beneath the bill, whereby the deformed portion of the bill that is bent is extended and the bill can be delivered in a straight condition.

At this time, the centrifugal-force impeller 21 is rotated at a speed that is equal to a delivery speed of the bill 2, so that even if a delivering force can not be obtained, the delivering of the bill is not prevented.

[0070]

Thus, it is possible to widely cope not only with normal bills but also with deformed or folded bills, prevent the jamming of the bills, and reduce the number of maintenance workers. Moreover, even if the centrifugal-force impeller 21 is plastically deformed and the vanes 21a are brought to deployed conditions as compared with the vanes at the time of being produced, the accumulating and delivering of the bill 2 are not prevented, and accumulating and delivering performance can be maintained for a long time.

[0071]

Incidentally, while one centrifugal-force impeller 21 is provided at each of the right and left sides of the shaft 22, several centrifugal-force impellers, for example, three centrifugal-force impellers may be provided at each of the right and left sides of the shaft 22.

Moreover, the number of the vanes 21a of the centrifugal-force impellers is not limited to four and may be plural or one.

[0072]

Furthermore, the shape of the vane 21a may not be curved and may be linear. In this case, even at the time of non-rotating of the centrifugal-force impeller, the vanes are in deployed conditions and slightly hang down by weight, but the vanes are effectively actuated at the time of the accumulation and delivery and can be, therefore, used without any trouble.

[0073]

Moreover, while the rubber material, of which the centrifugal-force impeller 21 is made, may be not only hard rubber but also soft rubber, it is desirable to make the centrifugal-force impeller from hard rubber for friction.

Furthermore, the vane 21a may be formed of hard rubber in such a manner to have a cavity or a soft portion in an interior thereof. Such a construction can provide a combination of wear resistant and flexibility.

[0074]

In equivalence between the construction of the present invention and the above-mentioned working example, the paper leaf accumulating and delivering apparatus according to the present invention corresponds to the bill accumulating and delivering apparatus 1 of the working example. The equivalence between the components of the present invention and the components of the working example will be as follows:

the paper leaf or the like corresponds to the bill 2,

the accumulation section corresponds to the accumulation space

3,
the rotary means corresponds to the centrifugal-force impeller 21,
the deformable piece corresponds to the vane 21a,
the rotating shaft corresponds to the shaft 22, and
the conveyance section corresponds to the conveyance way 51.

While the present invention is not limited to the construction of the above-mentioned working example, the present invention can be applied to various types of working examples.

[Brief Description of the Drawings]

[Figure 1] The perspective view showing the appearance of the bill accumulating and delivering apparatus;

[Figure 2] The exploded perspective view illustrating the structure of the bill accumulating and delivering auxiliary-unit;

[Figure 3] The front view of the bill accumulating and delivering auxiliary-unit;

[Figure 4] The partially sectional front view of the bill accumulating and delivering auxiliary-unit;

[Figure 5] The explanatory view for explaining the shape and function of the centrifugal-force impeller;

[Figure 6] The right side sectional view of the bill accumulating and delivering apparatus at the time of the accumulation;

[Figure 7] The right side sectional view of the bill accumulating and delivering apparatus at the time of the delivery;

[Figure 8] The front view of the bill accumulating and delivering auxiliary-apparatus;

[Figure 9] The explanatory view for explaining the operation of the vane with respect to the deformed bill;

[Figure 10] The right side sectional view showing the conventional bill accumulating and delivering apparatus at the time of the accumulation; and

[Figure 11] The right side sectional view illustrating the conventional accumulating and delivering apparatus at the time of the delivery.

[Description of Reference Numeral]

1 ··· Bill accumulating and delivering apparatus
2 ··· Bill
3 ··· Accumulation space
3a ··· Connecting portion
21 ··· Centrifugal-force impeller
21a ··· Vane
21c ··· Base portion
21d ··· Middle portion
21e ··· Tip portion
21f ··· Radius distance
22 ··· Shaft
51 ··· Conveyance way

[Name of Document] Abstract

[Abstract]

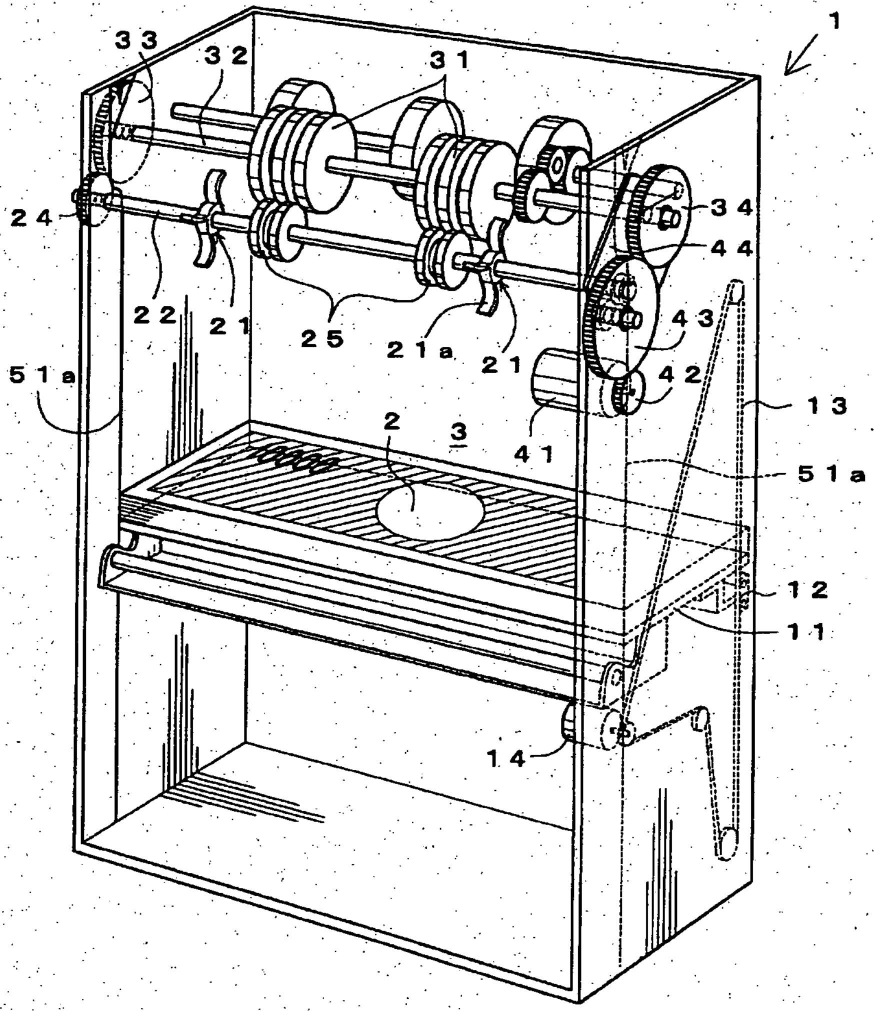
[Object] There are proposed a paper leaf accumulating and delivering method and apparatus, and rotary means, which fully cope with even deformed bills at the time of accumulation and do not prevent the delivery of the bills at the time of delivery regardless of plastic deformation. A decrease in the frequencies of replacement and maintenance of the rotary means, and a prolonged continuous running time of the paper leaf accumulating and delivering apparatus are achieved, thus realizing the synthetic decreasing of costs including the production cost and running cost of the paper leaf accumulating and delivering apparatus.

[Constitution] In a paper leaf accumulating and delivering method and apparatus for carrying out an accumulating process for dropping paper leaves conveyed through a delivery section and causing the paper leaves to be accumulated in an accumulation section, and a delivering process for delivering the paper leaves accumulated in the accumulation section to the delivery section, the paper leaf accumulating and delivering method and apparatus includes rotary means arranged near a connecting section between the delivery section and the accumulation section, the rotary means being provided with deformable pieces that are deformable in radius distances between their tip portions and a rotating shaft, the rotary means being designed such that at the time of the accumulating process, the rotary means is rotated in an accumulation

direction and actuated so as to kick off the paper leaves through the deformable pieces in which the radius distances are increased, and at the time of the delivering process, the rotary means is rotated in a delivery direction and actuated so as to allow the paper leaves to be delivered.

[Figure to be Selected] Figure 9

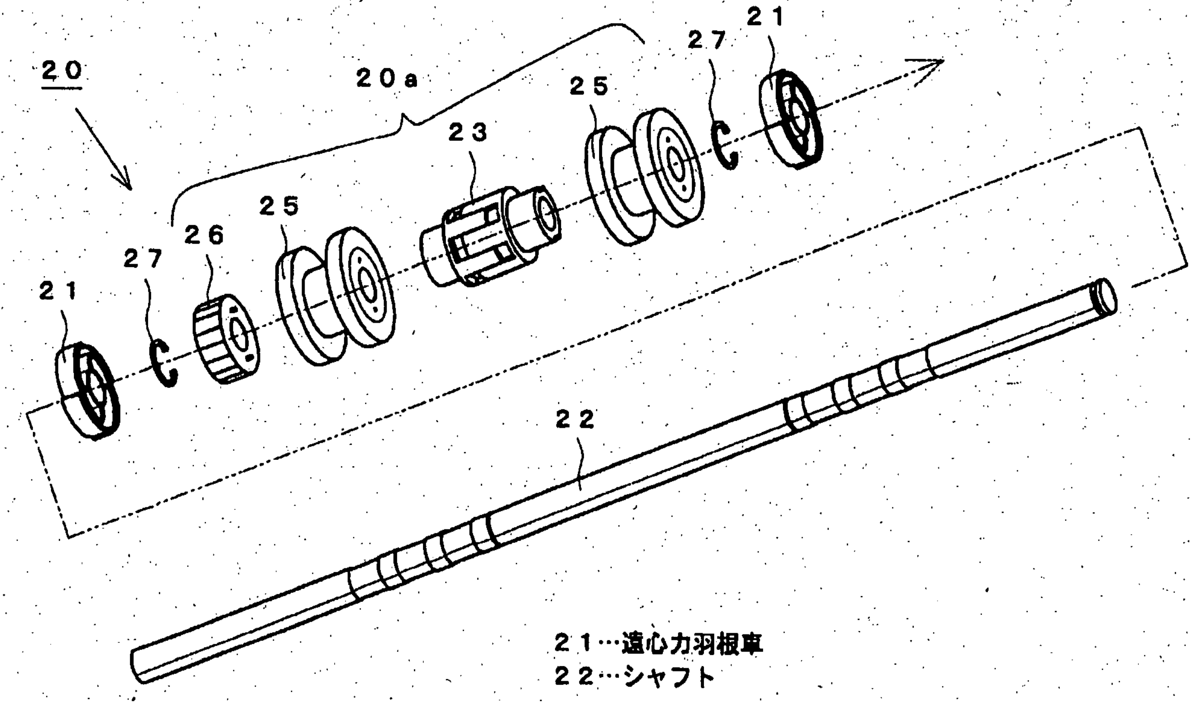
FIG. 1



１…紙幣集積繰出装置　２１ａ…羽
３…集積空間　２２…シャフト
２１…遠心力羽根車

1. BILL ACCUMULATING AND DISPATCHING APPARATUS
3. ACCUMULATION SPACE
21. CENTRIFUGAL IMPELLER
21a. VANE
22. SHAFT

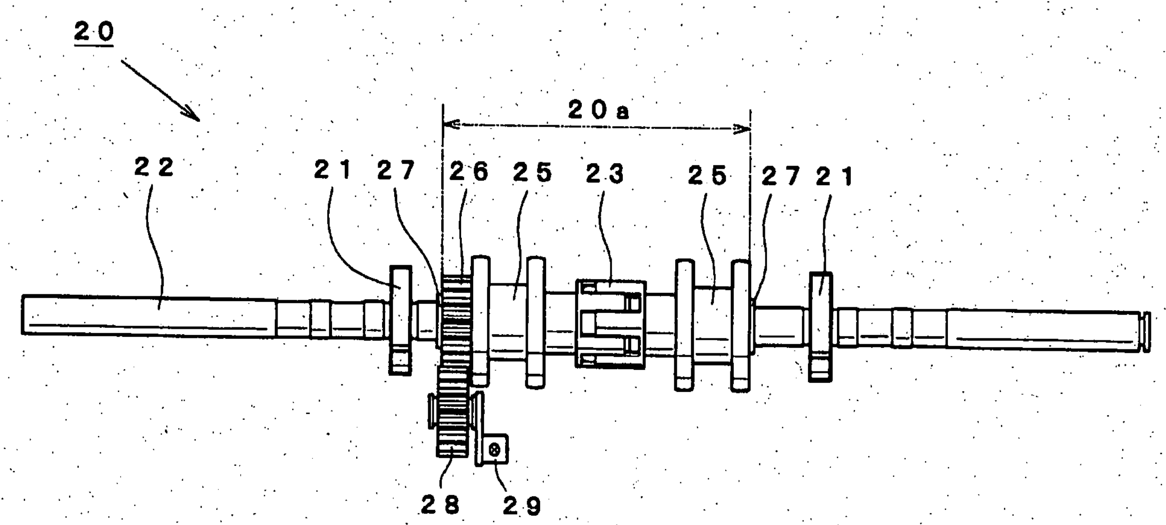
FIG. 2



2 1…遠心力羽根車
2 2…シャフト

21. CENTRIFUGAL IMPELLER
22. SHAFT

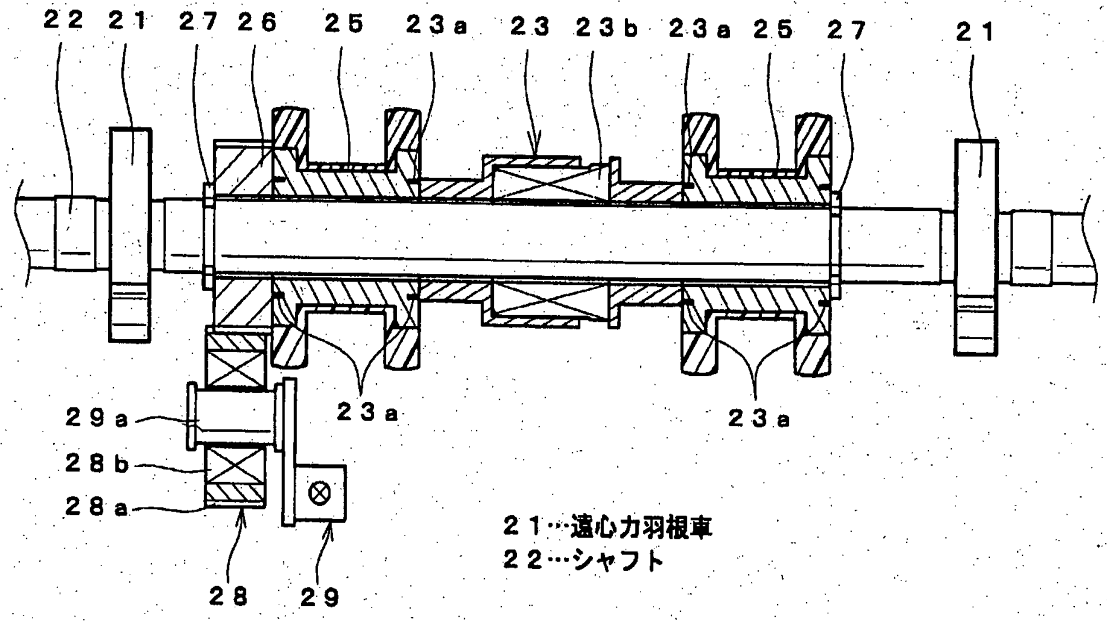
FIG. 3



２１…遠心力羽根車
２２…シャフト

21. CENTRIFUGAL IMPELLER
22. SHAFT

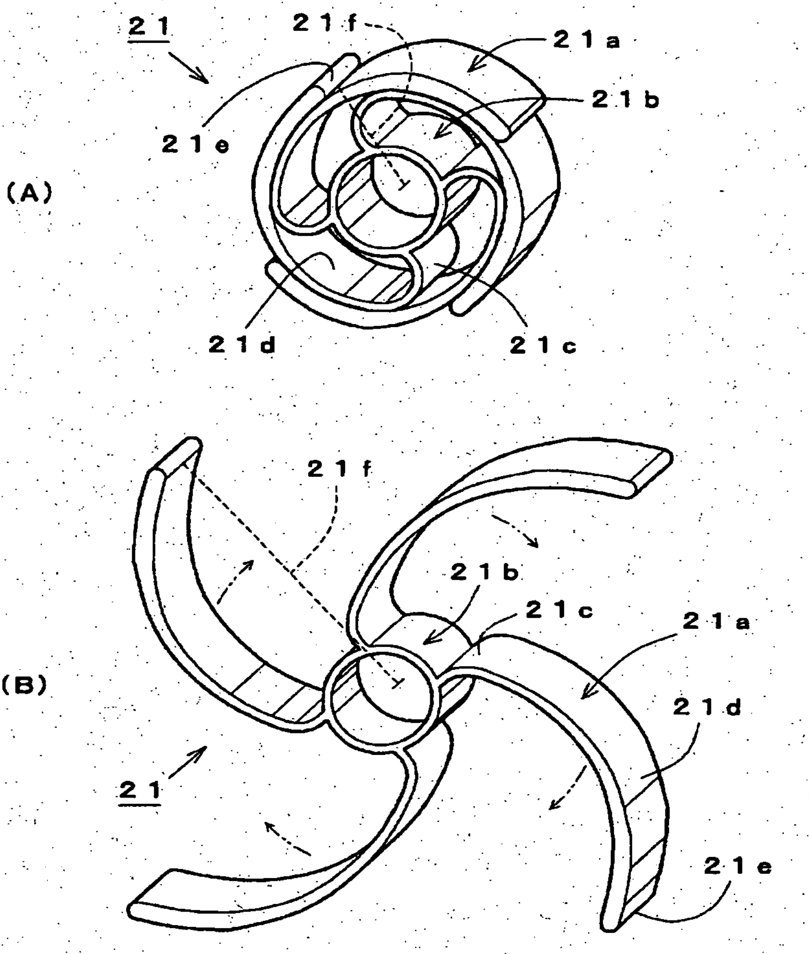
FIG. 4



21…遠心力羽根車
22…シャフト

21. CENTRIFUGAL IMPELLER
22. SHAFT

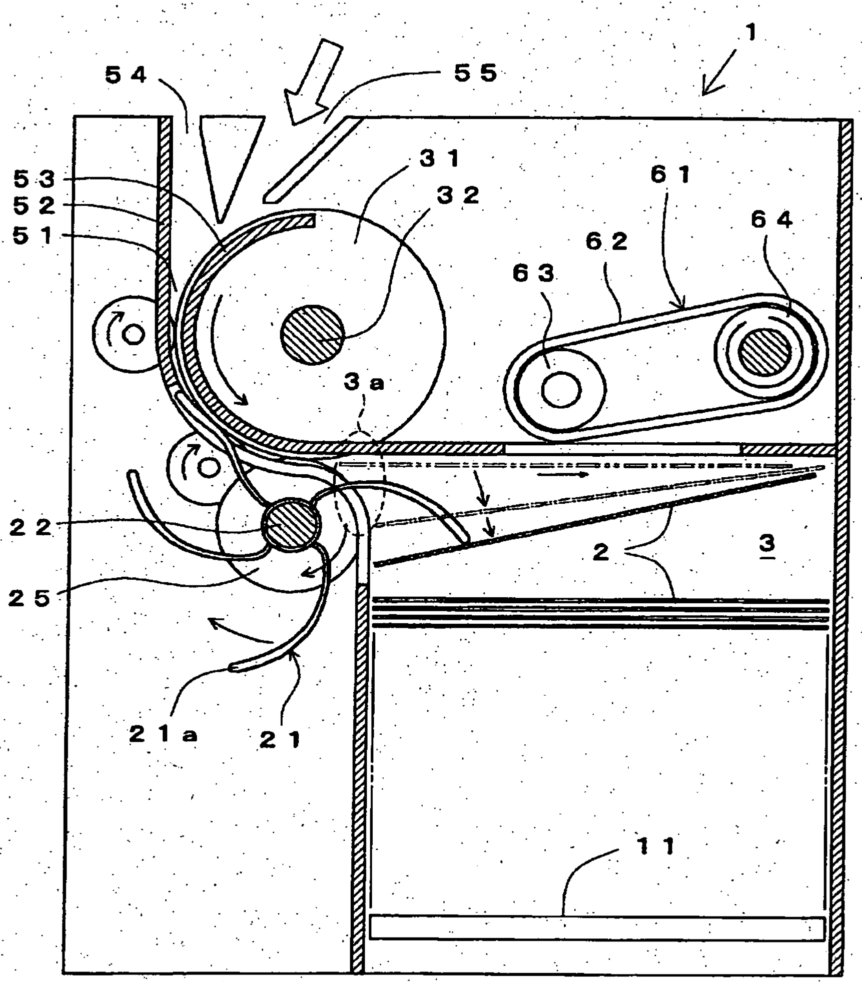
FIG. 5



２１…遠心力羽根車　２１ｃ…基部　２１ｅ…先端部
２１ａ…羽　２１ｄ…中間部　２１ｆ…半径距離

21. CENTRIFUGAL IMPELLER
21a. VANE
21c. BASE PORTION
21d. MIDDLE PORTION
21e. TIP PORTION
21f. RADIUS DISTANCE

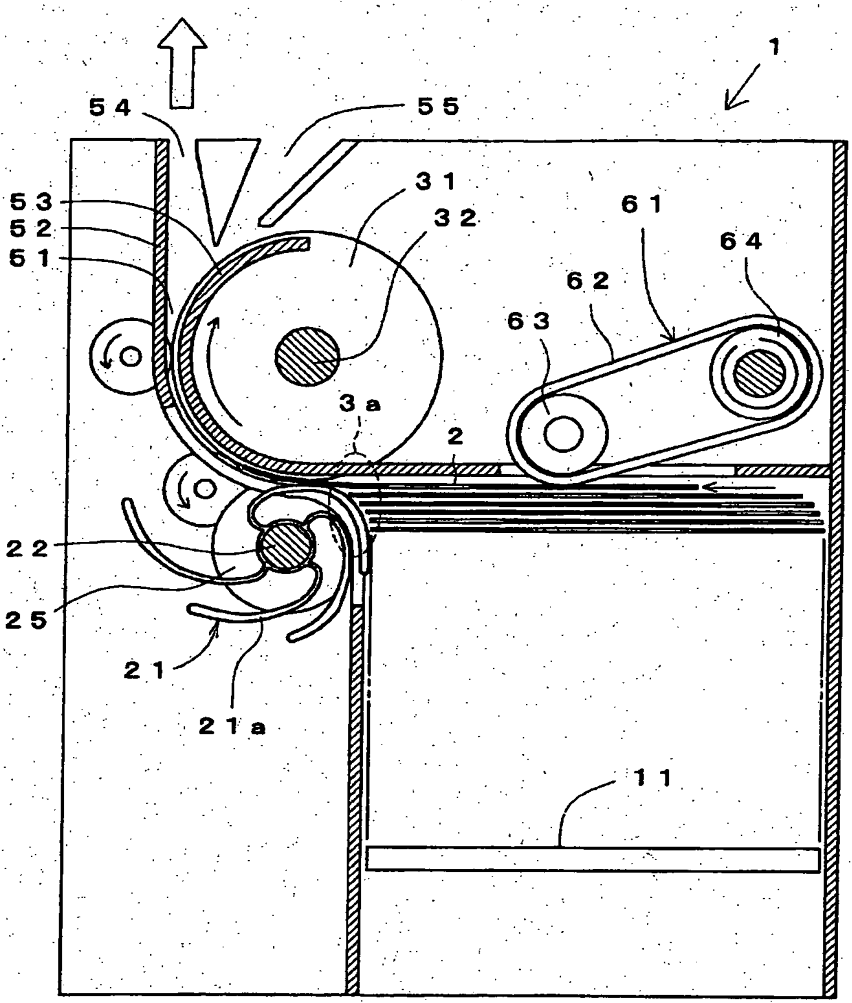
FIG. 6



1…紙幣集積繰出装置　２１…遠心力羽根車
2…紙幣　２２…シャフト
3…集積空間　５１…搬送路

1. BILL ACCUMULATING AND DISPATCHING APPARATUS
2. BILL
3. ACCUMULATION SPACE
21. CENTRIFUGAL IMPELLER
22. SHAFT
51. CONVEYANCE WAY

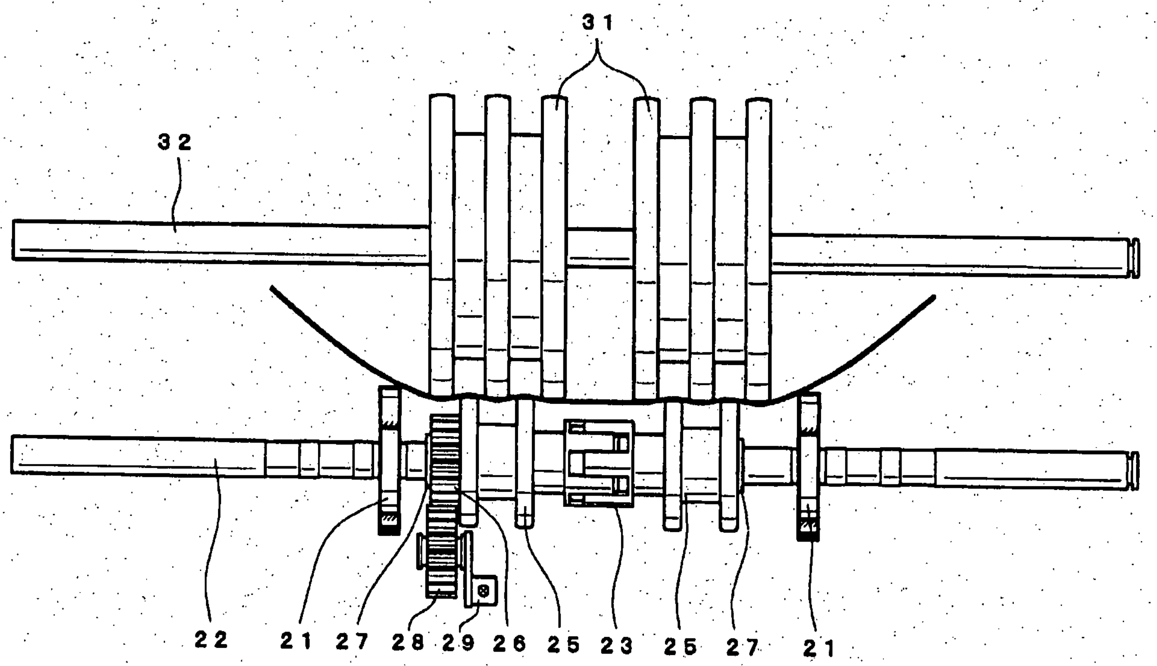
FIG. 7



１…紙幣集積繰出装置
２…紙幣
３…集積空間
２１…遠心力羽根車
２２…シャフト
５１…搬送路

1. BILL ACCUMULATING AND DISPATCHING APPARATUS
2. BILL
3. ACCUMULATION SPACE
21. CENTRIFUGAL IMPELLER
22. SHAFT
51. CONVEYANCE WAY

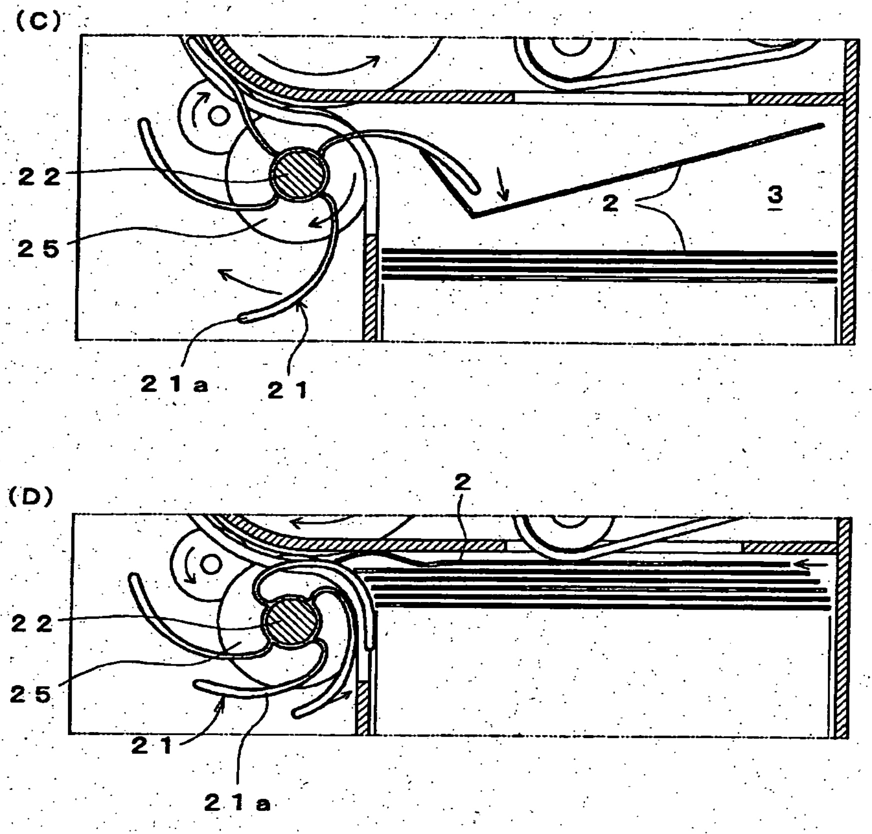
FIG. 8



２１…遠心力羽根車
２１ａ…羽
２１ｃ…基部
２１ｄ…中間部
２１ｅ…先端部
２１ｆ…半径距離
２２…シャフト

21. CENTRIFUGAL IMPELLER
21a. VANE
21c. BASE PORTION
21d. MIDDLE PORTION
21e. TIP PORTION
21f. RADIUS DISTANCE
22. SHAFT

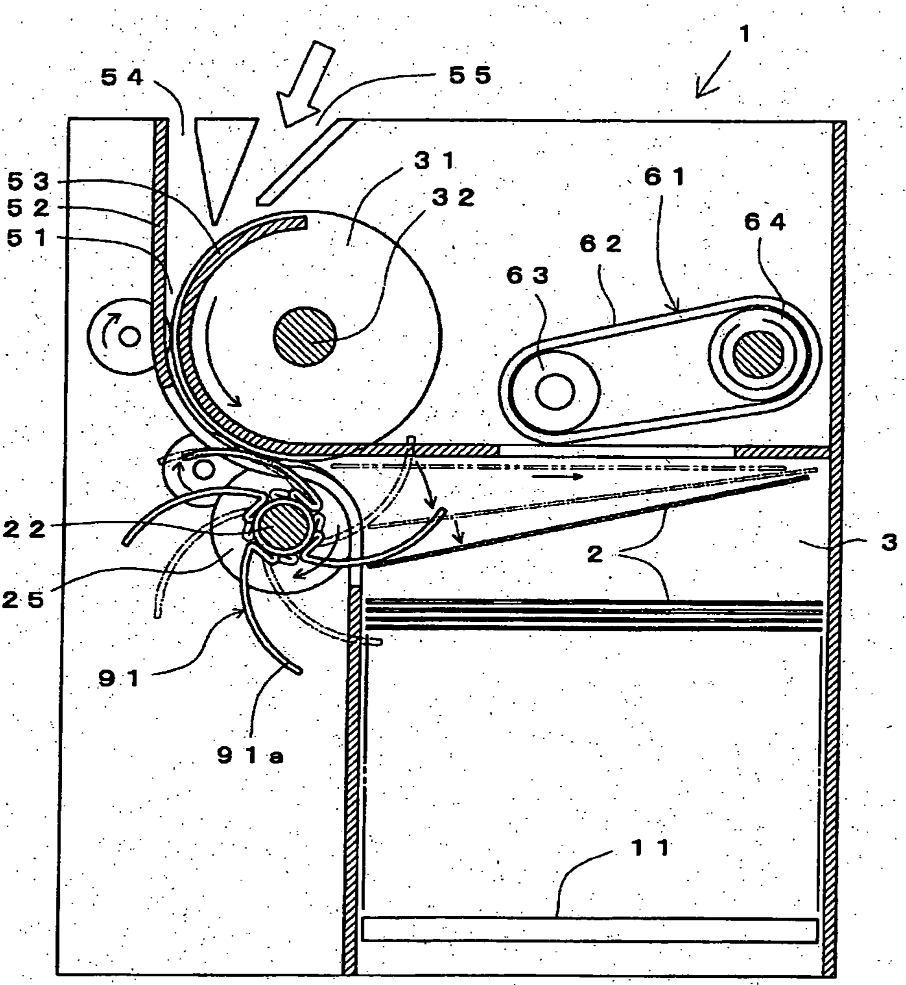
FIG. 9



２…紙幣　２１…遠心力羽根車
３…集積空間　２２…シャフト

2. BILL
3. ACCUMULATION SPACE
21. CENTRIFUGAL IMPELLER
22. SHAFT

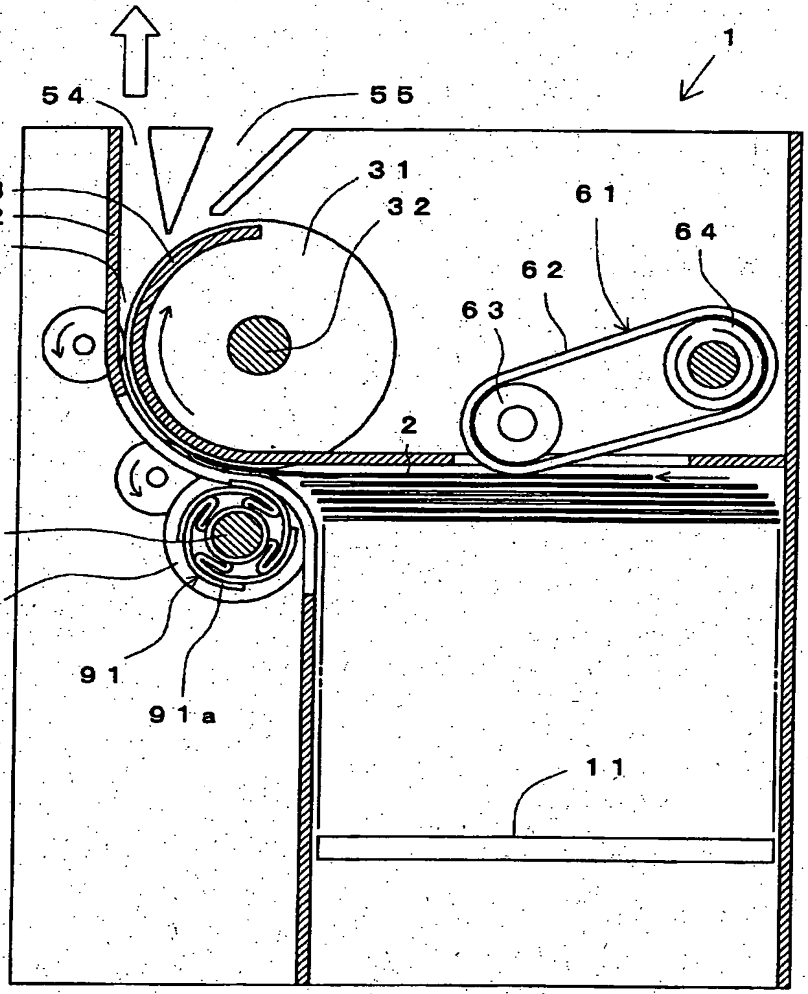
FIG. 10



１…紙幣集積繰出装置
２…紙幣
３…集積空間
９１…遠心力羽根車
９１ａ…羽

1. BILL ACCUMULATING AND DISPATCHING APPARATUS
2. BILL
3. ACCUMULATION SPACE
91. CENTRIFUGAL IMPELLER
91a. VANE

FIG. 11



1…紙幣集積繰出装置
2…紙幣
3…集積空間
91…遠心力羽根車
91a…羽

1. BILL ACCUMULATING AND DISPATCHING APPARATUS
2. BILL
3. ACCUMULATION SPACE
91. CENTRIFUGAL IMPELLER
91a. VANE

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